Office of Naval Research GLOBAL
USN — Science & Technology

2020

ONR Global
International Science
PROSPECTUS

CONTENTS

FROM ONR GLOBAL'S COMMAND
Welcome

This is our International Science Prospectus for fiscal year (FY) 2020, which covers international networking, collaborations and fundamental research grants having naval relevance. International science tools utilized by our science directors are provided along with the countries, university and institution partnerships, technology areas and co-funding sources covered by each tool.

It has been a difficult and challenging year with the passing of one of our own ONR Global team members, as well as the COVID-19 pandemic bringing health concerns and travel restrictions, affecting many of our science tools. As new norms arise, it has become an organizational opportunity to learn, embrace, gain agility and adapt to these changes.

Additionally, the Addendum provides a total portfolio listing of all on-going and new investments throughout the fiscal year. The goal we have in providing this is to increase and enable ONR Global's corporate international science awareness, engagement and opportunities with you. Notable objectives include the following:

- Ability to keyword search for areas of interest throughout this Prospectus
- Provide connections with our science director subject matter experts (SMEs) to exchange ideas and paths forward and to establish future collaborations
- Provide investment engagement details and published material via the Defense Technical Information Center (DTIC) website or through coordination with our science director SMEs
- Consider areas of interest at the university-institute level

Please contact us if you have any questions, feedback, recommendations or engagement-leverage opportunities.

Sincerely,

Capt. James Borghardt

Capt. James Borghardt	**Dr. Rhett Jefferies**	**Capt. Matthew Farr**
Commanding Officer (CO)	Technical Director (TD)	Executive Officer (XO)
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ONR GLOBAL MISSION

To serve as the enduring Navy and Marine Corps global presence in technical and operational communities, investing in trusted partnerships to discover and connect science and technology leaders for sustained maritime security.

INTERNATIONAL SCIENCE TECHNICAL STAFF

ONR Global's technical staff consists of a technical director, 20 science directors and two military regional directors. Science directors act as technical brokers linking the Office of Naval Research (ONR), Naval Research Laboratory (NRL) and Naval Research Enterprise (NRE) with international science and technology (S&T). Professional attributes include doctorate degrees in relevant fields, experience with the NRE, foreign language skills and international S&T experience. Our ONR Global on-site locations include the following:

- Arlington (includes executive officer)
- London (includes technical director and regional director)
- Melbourne
- Prague
- Santiago
- Sao Paulo
- Singapore
- Tokyo (includes regional director)

ONR Global's composition and placement is in alignment with the National Defense Strategy's understanding of worldwide S&T trends. Science directors, in addition to their locations, are assigned countries to monitor, covering the following footprint (includes COCOM Partnerships):

- **Europe**+: Austria, Baltics, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, UK, Ukraine
- **Indo-Pacifi**c: Australia, China, Hong Kong, Indonesia, India, Japan, Macau, Malaysia, New Zealand, Philippines, Republic of Korea, Russia (Far East), Singapore, Taiwan, Thailand, Vietnam
- **Middle East/Africa**
- **Americas**: Argentina, Brazil, Canada, Chile, Colombia, Mexico, Peru

SCIENCE DIRECTORS

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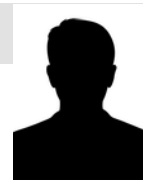
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Dr. Martina Siwek
Czech Republic

FRAMEWORK

International Science Having Naval Relevance

International science priorities and naval relevance comes from the following guidance:

1. **NRE R&D Framework (ONR, DC): A Framework for the Navy and Marine Corps After Next**
   - Five Integrated Research Portfolios
   - Five Actionable Technology Priorities

2. **Under Secretary of Defense for Research and Engineering USD (R&E), (OSD, DC); Technical Domain Priorities**
   - 11 Areas having naval applicability

NRE INTEGRATED PORTFOLIOS

- Information, Cyber and Spectrum Security
- Ocean Battlespace and Expeditionary Access
- Mission Capable, Persistent and Survivable Naval Platforms
- Aviation, Force Projection and Integrated Defense
- Warfighter Performance

NAVAL RESEARCH AND DEVELOPMENT

A FRAMEWORK FOR ACCELERATING TO THE NAVY & MARINE CORPS AFTER NEXT

NRE TECHNICAL PRIORITIES

- Augmented Warfighter
- Operational Endurance
- Integrated and Distributed Forces
- Sensing and Sense Making
- Scalable Lethality

DoD Modernization Priorities
- Hypersonics
- Fully Networked Command, Control and Communication
- Space
- Autonomy
- Directed Energy
- Cyber
- Quantum Science
- Microelectronics
- Biotechnology
- Machine Learning/Artificial Intelligence
- 5G

A Year's Overview

INTERNATIONAL SCIENCE TOOLS

International science tools available to ONR Global's technical staff include the following:

1. Digital Search
2. Liaison Visits
3. Visiting Scientist Program (VSP)
4. Collaborative Science Program (CSP)
5. Research Grants*

Specific FY2020 portfolio information is contained in the following pages:

> *Small, early investments can lead to significant results.*

*Research grants were formally known as Naval International Cooperative Opportunities Programs (NICOP).

INTERNATIONAL SCIENCE TOOL: LIAISON VISITS

ONR Global's technical staff attends international events and visits international institutions to develop, access and discover cutting-edge science and technology. These international science networking liaison visits are the primary tool in monitoring overall Global Technical Awareness (GTA). Additionally, they can foster future VSP, CSP and Research Grant opportunities. For FY2020, ONR Global had over 150 Liaison Visits, with approximately 25 percent being virtual engagements across 29 countries.

For FY2020, ONR Global had over 150 Liaison Visits across 29 countries. GTA-related areas included the following (sample):

- Acoustics and Undersea Technologies
- AI, Machine Learning, Human-Machine, Robotics, Autonomy and Swarm Autonomy
- Additive Manufacturing
- Biology and Biotechnologies
- Command, Control and Communications
- Cyber
- Data Science
- Directed Energy
- Environmental Science
- Electronic Warfare
- Fluid Science and Dynamics
- Hypersonic
- Hypersonic
- Information Science
- Marine Science and Oceanography
- Material Science; including Coatings, Composites, Structural, Nano and Metamaterials, Electronics
- Operational Energy
- Optics and Sensors
- Pandemic Response
- Physics
- Synthetic Biology
- Quantum Science and Technologies

COUNTRIES

Argentina	Denmark	Israel	Republic of Korea	Taiwan
Australia	El Salvador	Japan	Serbia	Thailand
Brazil	France	Malta	Singapore	UAE
China	Georgia	Netherlands	Spain	United Kingdom
Colombia	Germany	New Zealand	Sweden	Vietnam
Czech Republic	India	Poland	Switzerland	

Liaison Visits

UNIVERSITIES, INSTITUTIONS AND ORGANIZATIONS

150+
Liaison Visits

29
Countries

- 3D Printing Corporation
- Advanced Materials and Enabling Technologies for Extreme Environments
- Agilent Technologies
- AI Center (AIC)
- American University of Sharjah (AUS)
- Argentina Naval Research Office
- Asia Defense Expo and Conference Series: Undersea Defence Technology
- AUSTRADE
- Australian Acoustical Society
- Australian Defence Force (ADF) Woomera Test Range
- Boeing Research and Technology (Australia)
- Boeing Research and Technology (Japan)
- Brazilian Naval Research Laboratory
- Brno University of Technology
- Burapha University
- Center for Information and Neural Networks
- Cereberus Marine
- Chungnam National University
- Cold Spring Harbor Asia Synthetic Biology Conference
- Cortical Dynamics
- CSIRO
- Cybersecurity Research Institute (CRI) of National Institute of Information and Communications Technology
- Czech Institute of Informatics, Robotics, and Cybernetics (CIIRC)
- Czech Technical University
- Danish Technical University
- DBC Systems
- Deakin University
- Defence Innovation Network
- Defence Science and Technology (DST) - Edinburgh and Fisherman's Bend
- Defence Science Institute
- DefendTex
- Defence Science and Technology Laboratory (DSTL)
- Federal Office for Defense Procurement (Armasuisse)
- Flinders University
- Ford Research Australia
- Forging an Alliance Innovation Base - America Competes 2020
- GeoSystem Research Corporation
- Gilmour Space Technologies
- Hamburische Sciffbau-Versuchsanstalt
- Helmholtz Institute
- Helmholtz Schmidt University
- Illumina

- Indian Institute of Science Bangalore
- Indian Institute of Technology Madras
- Institut de la Vision
- Institute of Computer Science of the CAS
- Institute of Information Theory and Automation (UTIA)
- Institute of Physics
- Institute of Scientific and Industrial Research, Osaka University, Japan
- Ivane Javakhishvili Tbilisi State University
- JFE Mineral Advanced Materials
- Kastler-Brossel Laboratory
- Kawasaki Heavy Industries
- Korea Advanced Institute of Science and Technology (KAIST)
- Korea University
- Korean Institute of Ocean Science and Technology (KIOST)
- Korean Research Inst. Ships and Ocean Engineering
- LaTrobe University
- Leibniz Institute German Collection of Microorganisms and Cell Cultures
- Lockheed Martin STELaR Lab
- Lund University
- Macquarie University
- Mahidol University
- MARCS Institute at University of Western Sydney
- Maritime Technology Research Institute
- Medical Petide
- Military Institute of Medicine
- Ministry of Defense (Brazil)
- Ministry of Defence Singapore Future Systems and Technology Directorate
- Ministry of Education and Science, Science and Technological Development
- Monash University
- National Central University
- National Chiao Tung University
- National Institute for Materials Science
- National Research Institute of Information and Communications Technology
- National Taiwan Ocean University
- National University of Singapore
- Netherlands Organization for Applied Research
- New York University Abu Dhabi (NYUAD)
- Novel Crystal Technologies (Tamura)
- Okinawa Institute of Science and Technology (OIST) Graduate University

Liaison Visits

UNIVERSITIES, INSTITUTIONS AND ORGANIZATIONS *(continued from page 9)*

- Osaka University
- Palacky University
- Photoptics
- Programme Nelson
- Pusan National University (PHY)
- Queensland Defence Industries Office
- Questek Japan/IHI Kickoff
- Research Institutes of Sweden (RISE) Acreo
- RMIT University
- Science and Technology Group (DSTG)
- Seoul National University
- Singapore Army Center of Excellence for Soldier Performance
- Singapore Institute of Technology
- Society of Naval Architecture and Ocean Engineering
- Sony, Computer Science Laboratories
- SPEE3
- Subaru/Fuji Heavy Industries
- Sungkyunkwan University
- Swinburne University
- Symposium on Synthetic and Systems Biology
- Systems Biology Institute (SBX and SBI)
- Technical University Braunschweig
- Technical University Hamburg
- Technical University Kaiserslautern
- Technion
- Tel Aviv University
- The Florey Institute of Neuroscience and Mental Health
- Thyssen Krupp Marine Systems
- TNO, Delft
- TNO, The Hague
- Toray Industries
- Trusted Autonomous Systems Defence Cooperative Research Center (TAS-DCRC)
- TU Delft
- UAE University (UAEU)
- UnitDX Incubator
- Universidad de Buenos Aires
- Universidad Nacional del Nordeste
- University College London
- University of Adelaide
- University of Belgrade
- University of Bristol
- University of Copenhagen

- University of Defence/Faculty of Military Medicine
- University of El Salvador
- University of Leipzig, Technical University Braunschweig
- University of Macau (UM)
- University of Melbourne
- University of New South Wales (Canberra, Sydney)
- University of New Zealand (Auckland)
- University of Novi Sad, BioSense Institute
- University of Pardubice/Energetic Department
- University of Saarland
- University of South Australia
- University of South Queensland
- University of Southampton
- University of Tuebingen
- University of Utrecht
- University of Wollongong
- University of York
- University of Zaragoza
- University of Sydney
- Victoria Quantum Technologies Network
- Victoria University
- Vidyasirimedhi Institute of Science and Technology (VISTEC)
- Vietnam National University (Ho Chi Minh)
- West Bohemia University

INTERNATIONAL SCIENCE TOOL: VISITING SCIENTIST PROGRAM

ONR Global supports travel of foreign scientists to the U.S. to socialize new S&T ideas or findings with the Naval Research Enterprise. For FY2020, ONR Global had five Visiting Scientist Program engagements across five countries and five institutions-universities covering four main technology areas. See the following for portfolio information:

TECH DOMAINS

Machine Learning
Operational Energy
Quantum Science
Sensors

COUNTRIES

Australia
Brazil
Israel
Switzerland
United Kingdom

Visiting Scientist Program PARTNERS

- Ben Gurion University
- University of Campinas
- University of Queensland
- University of Surrey
- University of Zurich

INTERNATIONAL SCIENCE TOOL: COLLABORATIVE SCIENCE PROGRAM

ONR Global supports foreign or international workshops and conferences having naval interest. This international science networking tool can also foster future Liaison Visits, VSPs and Research Grants, along with providing overall Global Technical Awareness (GTA).
For FY2020, ONR Global had 23 Collaborative Science program engagements, with approximately 25 percent being virtual engagements becoming a new agility norm across 13 countries.
See the following for portfolio information:

TECH DOMAINS

- Additive Manufacturing (AM)
- Advanced Sensors
- Bioprinting
- Computer Science
- EW
- Environmental Science
- Fluid Mechanics
- Maritime Technologies
- Material Metals
- Material Structures
- Medical - Shock Trauma
- Meta-Materials
- Microwaves, Communications, Antennas
- Ocean Battlespace
- Platform Hydrodynamics
- Quantum Technology
- Signals and Image Processing
- Synthetic Biology
- Wave Mechanics

COUNTRIES

- Australia
- Austria
- Brazil
- Chile
- Georgia
- Germany
- India
- Israel
- Italy
- Japan
- Singapore
- Switzerland
- United Kingdom

CO-FUNDING SOURCES

Army
Air Force
ITC-Pacific

Collaborative Science Program

PARTNERS

23
Science Engagements

13
Countries

- Ecole Polytechnique Federale de Lausanne
- Falculdades Catolicas
- Foundation Athenalab
- Fundacao Educacional Ciencia e Desenvolvimento (FECD)
- Hamburg University of Technology
- Helmholtz Institute for RNA-Based Research
- Indian Institute of Science Bangalore
- Ivane Javakhishvili Tbilisi State University
- JP Light Metal Welding Association
- Ludwig Boltzmann Gesellschaft - Österreichische Vereinigung
- Monash University

- National University of Singapore
- Ortra Ltd.
- Osaka University
- Pontifica Universidad Católica de Chile
- Universidad de Santiago de Chile
- Universidade Federal Fluminense
- Universidade Federal de Santa Catarina
- University of Adelaide
- University of Melbourne
- University of Newcastle
- University of Roma Tre
- University of Sydney

Collaborative Science Program

ENGAGEMENTS

- 11th Marine and Hydrodynamics
- 14th International Aluminum Conference
- 1st USA-India Lecture Series on Aging Aircraft
- 33rd Symposium on Naval Hydrodynamics
- 3rd International CRSIPR Conference
- 8th Asia Pacific Workshop on Structural Health Monitoring
- Avante 2020 Challenge
- Bioinspired Materials 2019
- Designer Biology Symposium
- First Workshop on Molecular Quantum Technology MQT 2019
- Future Trends in Synthetic Biology, Asian Perspectives
- IWSSIP-27th International Conference on Systems, Signals and Image Processing
- Industry 4.0 and Bioprint in Regenerative Medicine
- KOZWaves2020
- Latin American Physics of Estuaries and Coastal Oceans

- Metamaterials 2020 - 14th International Congress on Artificial Materials for Novel Wave Phenomena
- PQS2019 Precision and Quantum Sensing Workshop
- Pacific Rim Conference on Lasers and Electro-Optics (CLEO-PR)
- Pan American Research in Additive Global Manufacturing (PARADIGMA 2019)
- SIBGRAPI 2019 - 32nd Conference on Graphics, Patterns and Image
- The 7th International IEEE Conference on Microwaves, Communications, Antennas and Electronic Systems (IEEE COMCAS 2019)
- Wiggers-Bernard Conference Initiative for Pre-clinical Modeling in Sepsis Research
- XXVth International Seminar/Workshop Direct and Inverse Problems of Electromagnetic and Acoustic Wave Theory (DIPED)

INTERNATIONAL SCIENCE TOOL: RESEARCH GRANTS

Research Grant Funding Criteria: ONR Global only funds Principal Investigators (PIs) outside of the U.S. Submissions are through GRANTS.GOV based on the ONR Headquarters Long Range Broad Agency Announcement (BAA). Government Organizations are not funded. Publishing in the open literature (research unclassified) is encouraged while the intellectual property remains with the PI. Deliverable is a final report and/or conference proceeding.

Research Grant Review Criteria: Grant is fundamental research verses product development, outreach, or education along with having technical quality and qualified PIs. Requires having Naval relevance potential, a documented research approach, and cost realism.

For FY20, ONR Global had 51 new research grants across 20 countries and 47 institutions-universities covering 19 main technology areas. See the following for portfolio information:

TECH DOMAINS

- Acoustic and Undersea Technologies
- AI, Machine Learning, Human-Machine, Robotics, Autonomy and Swarm Autonomy
- Arctic, Antarctic
- Biology and Biotechnologies
- Command, Control, and Communications (C3)
- Computer Science
- Data Science
- Directed Energy
- Environmental Science
- Fluid Science and Dynamics
- Information Science
- Marine Science & Oceanography
- Material Science including Structural, Nano and Metamaterials
- Operational Energy
- Optics and Sensors
- Pandemic Response
- Physics
- Synthethic Biology
- Quantum Science and Technologies

COUNTRIES

Argentina	Italy
Australia	Japan
Belgium	Mexico
Brazil	Poland
Brunei	Republic of Korea
Chile	Slovenia
Costa Rica	Sweden
Czech Republic	Switzerland
France	United Kingdom
Germany	Vietnam

CO-FUNDING SOURCES

Army

Air Force

ITC-Pacific

Research Grants
PARTNERS

51
Research Grants

20
Countries

- Alan Turing Institute
- Assoc. Do Lab. De Sistemas Integráveis Tecnológivo Lsitec
- C3 Bio-technologies Limited
- Chancellor Masters and Scholars of the University Of Oxford
- Chungnam National University
- CNIT
- Cnr-ifn, Institute of Photonics and Nanotechnology
- Deakin University
- Ecole Polytechnique Fédérale De Lausanne
- Engineering Universita' Degli Studi Della Campania Luigi Vanvitelli
- Evangelia Hatzidaki
- Faculty of Science, Universiti Brunei Darussalam
- Fondation Voir et Entendre, Institut de la Vision
- Fundacao de Ciencia, Aplicacoes e Tecnologia Espaciais
- Fundação Joseense De Ensino E Pesquisa Em Odontologia
- Fundacion Argentina Del Sueño
- Fundacion Centro De Alta Tecnologia
- Geosystem Research Corp.
- Imperial College London
- Institute for Environment and Resources
- Instituto De Investigaciones En Fisicoquimica De Cordoba
- Juan Pablo Cardenas Servicios Informaticos Investigaciones
- Kungliga Tekniska Hogskolan
- Lund University

- Macquarie University
- National Institute of Chemistry
- National Taiwan University
- National University of Singapore
- Novel Crystal Technology, Inc.
- Politechnika Wroclawska
- Pusan National University
- Rise Research Institutes Of Sweden
- Royal Melbourne Institute of Technology
- Seoul National University
- The University Court of the University of Edinburgh
- The University of Glasgow
- The University of New South Wales
- The University of Oxford
- Universidad Autonoma De Nuevo Leon
- Universidad Nacional Autónoma De México
- Universita' Degli Studi Di Udine (University Of Udine)
- University College London
- University of Bayreuth
- University of Bristol
- University of Edinburgh, Department Of Mathematics
- University of Essex
- University of Melbourne
- University of Strathclyde Viz Royal
- University of Sydney
- Western Sydney University
- Zapadoceska Univerzita V Plzni

GLOBAL-X CHALLENGE AWARDS OVER $1 MILLION

The International Global-X Challenge, launched in April by the Office of Naval Research (ONR) Global, selected four winning projects that will demonstrate revolutionary capabilities for the U.S. Navy, Marine Corps, commercial marketplace and the public.

The awards, totaling over $1.1 million, fall under two challenge areas. The selected international teams of researchers will have nine months to demonstrate that their concepts successfully meet objectives.

Global-X Challenge is designed to discover, disrupt and ultimately provide a catalyst for development and delivery of new capabilities. Following successful concept demonstration by the four winning teams in June 2021, ONR Global may support an additional nine months of research, while transition partners prepare to implement technology maturation for insertion into the fleet.
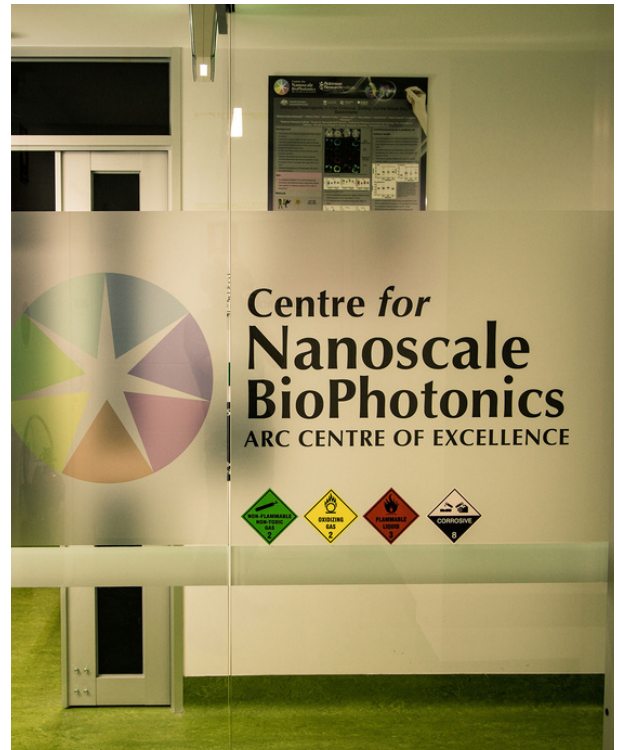
"We are very excited about the level of interest generated by this initial stage of the first-ever edition of Global-X," said ONR Global's Executive Officer Capt. Matthew Farr. "We received groundbreaking proposals from all around the world—highly capable ideas with the potential to deliver value throughout the U.S. Navy and Marine Corps. We expect great things from the teams we selected for the next phase of capability demonstration."

After evaluating 11 full proposals—chosen from 385 highly competitive white papers from 33 different countries—ONR Global selected four teams, with members from Australia, Denmark, Spain, Switzerland, the United Kingdom and the United States. Under the challenge topic "Multifunctional Maritime Films for Persistent and Survivable Platforms and Warfighters," Dr. Nick Aldred, University of Essex, and his team will demonstrate a sample biofilm that will resist biofouling with the goal of eventually replacing traditional hull coatings. The concepts of the remaining three winning teams address the challenge topic "Object Detection and Identification in any Medium."

GLOBAL-X CHALLENGE AWARDS OVER $1 MILLION

At the same time, Dr. Teuta Pilizota, University of Edinburgh, and her team will explore whether a self-sustained electrical bio-chip can detect flow and small traces of chemicals.

Finally, Professor Gregory Cohen, Western Sydney University, and his team will demonstrate neuromorphic event-based sensors that can quickly detect submerged vehicles and objects—and enable celestial navigation without breaking the water surface.

ONR Global's Technical Director Dr. Rhett Jefferies stated, "Global-X has already stimulated novel, high-risk multidisciplinary research ideas with both military and commercial value and that may address current and future U.S. Navy and Marine Corps technology needs. We are confident the winning projects we selected will provide a glimpse of new capabilities, forever changing how we operate."

More information can be found on the Global-X website: https://www.onr.navy.mil/Global-X/.
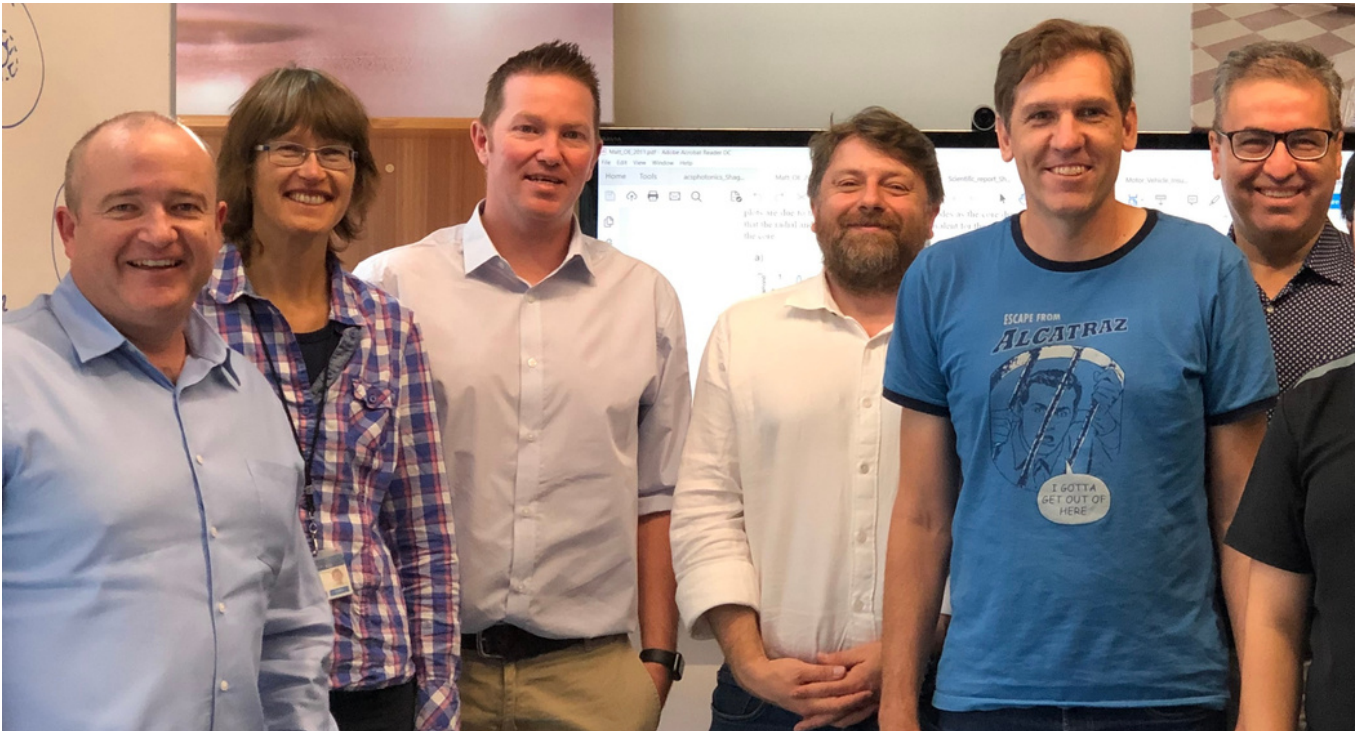
ONR Global sponsors scientific efforts outside of the U.S., working with scientists and partners worldwide to discover and advance naval capabilities.

IN REMEMBRANCE
Dr. Judah Goldwasser

Dr. Judah Goldwasser, a science director for the Office of Naval Research (ONR) Global and a renowned international materials scientist, died on March 23, 2020, in London, England, at the age of 66.

"Judah has had a broad impact on the defense of our nation and the freedoms it holds so dear," said Capt. James Borghardt, ONR Global commanding officer. "His impact on the capability of the men and women willing to serve the rest of us will last for generations. Most will never know his name, but they will succeed because of his efforts."

At ONR Global, Goldwasser worked with the European community and the U.S. Navy and the Marine Corps to enhance performance in functional materials, and integrate functional and structural material properties. This research notably advanced ultrahigh-performance, miniaturized and reconfigurable sensors, power electronics and energy storage.

Goldwasser explored methods to fabricate high-strength, lightweight materials capable of ultrahigh temperature operation. The outcome of this research to naval systems is material with strength of steel, the operating temperature of ceramics, the toughness of polymers, and the density of water—leading to higher-temperature turbine engines, enhanced hypersonics, and resistance to failure/corrosion.

Dr. Patricia Gruber, former technical director of ONR Global,

worked with Goldwasser during his years in London and said: "Dr. Goldwasser not only had an unsurpassed understanding of materials for naval applications, but he was excellent at building collaborations between the Navy and Marine Corps, the academic community and our international partners. He never failed to provide thoughtful advice to his colleagues, myself included."

"Judah did not dedicate his life for fame or fortune, but instead he dedicated his life to helping others and to defending freedom," said Borghardt. "We will, of course, miss Judah terribly, but we are each better for having him in our life and for that we will be eternally grateful."

HIGHLIGHTS OF OUTCOMES AND RESULTS

Small early investments in fundamental research can lead to significant and follow-on results. For FY2020, outcomes include:

- ★ **Award Recognitions**
- ★ **Knowledge Transfers**
- ★ **Patents**
- ★ **Presentations**
- ★ **Publications**
- ★ **TRL Progressions**
- ★ **Press Releases**
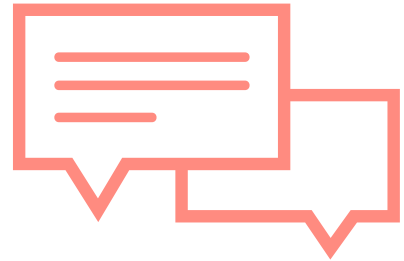
PREVIEW OF RESEARCH GRANTS

- Advanced Methods for Blind Extraction of Independent Sources from Multi-Sensor Observations
- AI-Based Workload Monitoring to Enhance Human-Machine Symbiotic Collaboration
- Bragg Grating Fiber Laser Ultrasonic Sensors for Structural Health Monitoring
- Covert State Discovery and Multi-Agent Reinforcement Learning for Human-Autonomy Teaming
- Development of Fatigue Monitoring Indicator Based on Affordable and Portable Biofeedback Technology for Concurrent High-Intensity Physical and Cognitive Tasks
- Exploring the Fundamental Mechanisms of Light Modulation and Amplification in Halide-perovskite Nanostructures
- Improvement of Thermal Stability of PIN-PMN-PT Single Crystal
- Molecular Mechanisms of Barnacle Adhesion: A Combined Structural Biology and Computational Study
- Nano-Optoelectronics for Insect Brain-Inspired Neuromorphic Computing
- Nucleation and Cavitation Inception in Tip Leakage Flows
- Optimization of Carbon Fiber Surfaces for Advanced Composites
- Tactile Sensing and Feedback for Grip Security
- Versatile Adaptive Micro Turbofan Engine Development for UAS Applications
- Vision Enhancement Using Eye Tracked Augmented Reality

ADDENDUM

INTERNATIONAL SCIENCE

PROSPECTUS
FY 2020

VSP

AUSTRALIA
- HTS Tape Characterization Over Long Lengths

BRAZIL
- Research Grant Kick-Off Meeting / Quantum Mechanical Sensors

ISRAEL
- Quantum Magnematory Atoms Correlation

SWITZERLAND
- Event-Based Polarized Sensors

UNITED KINGDOM
- Speaker at Naval Applications for Machine Learning (NAML) 2020

CSP

AUSTRALIA

- 8th Asia Pacific Workshop on Structural Health Monitoring (Monash University)
- KOZWaves2020 (University of Melbourne)
- Pacific Rim Conference on lasers and Electro-Optics, CLEO-PR (University of Sydney)
- PQS2019 Precision and Quantum Sensing Workshop (University of Adelaide)

AUSTRIA

- Wiggers-Bernard Conference Initiative for Pre-Clinical Modeling in Sepsis Research (Ludwig Boltzmann Gesellschaft - Österreichische Vereinigung)

BRAZIL

- Industry 4.0 and Bioprint in Regenerative Medicine (Fundacao Educacional Ciencia e Desenvolvimento FECD)
- Latin American Physics of Estuaries and Coastal Oceans (Universidade Federal de Santa Catarina)
- SIBGRAPI 2019 - 32nd Conference on Graphics, Patterns and Image (Falculdades Catolicas)
- IWSSIP-27th International Conference on Systems, Signals and Image Processing (Universidade Federal Fluminense)

CHILE

- Pan American Research in Additive Global Manufacturing, PARADIGMA 2019 (Pontifica Universidad Catolica de Chile)
- First Workshop on Molecular Quantum Technology MQT 2019 (Universidad de Santiago de Chile)
- Avante 2020 Challenge (Fundacion Athenalab)

GEORGIA

- XXVth International Seminar/Workshop Direct and Inverse Problems of Electromagnetic and Acoustic Wave Theory, DIPED (Ivane Javakhishvili Tbilisi State University)

GERMANY

- 11th Marine and Hydrodynamics (Hamburg University of Technology)
- 3rd International CRSIPR Conference (Helmholtz Institute for RNA-based research)

INDIA

- 1st USA-India Lecture Series on Aging Aircraft (Indian Institute of Science Bangalore)

CSP

ISRAEL

- The 7th International IEEE Conference on Microwaves, Communications, Antennas and Electronic Systems, IEEE COMCAS 2019 (Ortra Ltd.)

ITALY

- Metamaterials 2020 - 14th International Congress on Artificial Materials for Novel Wave Phenomena (University of Roma Tre)

JAPAN

- 33rd Symposium on Naval Hydrodynamics (Osaka University)
- 14th International Aluminum Conference (JP Light Metal Welding Association)

SINGAPORE

- Future Trends in Synthetic Biology, Asian Perspectives (National University of Singapore)

SWITZERLAND

- Bioinspired Materials 2019 (Ecole Polytechnique Federale de Lausanne)

UNITED KINGDOM

- Designer Biology Symposium (University of Newcastle)

RESEARCH GRANTS

FISCAL YEAR 2015 GRANTS

AUSTRALIA
- Effect of Seawater Absorption on the Explosive Blast Resistance of Naval Composites (Royal Melbourne Institute of Technology)

FISCAL YEAR 2016 GRANTS

PORTUGAL
- Real Time Tracking and Display of Multiple Objects in Extreme Lighting Conditions (INESC TEC - Institute de Engenharia de Systems e Computador)

FISCAL YEAR 2017 GRANTS

AUSTRALIA
- Optimizing Cognitive Performance by Mimicking Slow-Wave Sleep in the Awake Brain (The University of Queensland)

CANADA
- High Resolution Nearshore Wave and Current Modeling to Investigate Nonlinear Wave Effects on Velocity Profiles and Sediment Transport (Queen's University at Kingston)
- The Effect of Ocean Surface Waves on Long Duration, Wide Bandwidth Waveforms in High Duty Cycle Sonars (Dalhousie University)

CROATIA
- AWAKE - Ultra Low Power Wake-Up Interfaces for Autonomous Robotic Sensor Networks in Sea/Subsea Environments (University of Zagreb)

GREECE
- Deciphering the Workings of Molecule Intercalated Iron Chalcogenides (Foundation for Research and Technology - HELLAS / Forth)

ITALY
- Developing a Probabilistic Model for Sediment Transport In Oscillatory Flow Using Direct Numerical Simulations (University Delgi Studi di Genova)
- How Microbiota Influence Brain Activity (Fondazione Centro San Raffaele)
- Modeling and Observation of River-Sea Exchanges at a Microtidal Estuary (Universita Politecnica delle Marche)
- Secure and Cognitive Communication in Underwater Networks (Centre for Maritime Research & Experimentation)

NETHERLANDS
- Fatigue Life of Post-Buckled Composite Structures (Technische Universiteit Delft)

NEW ZEALAND
- Feeling Like a Fish - Cyber-Proprioception and Distributed Stretch/Touch Sensitivity for Unmanned Underwater Vehicles)

SWITZERLAND
- Learning-Based Dimensionality Reduction (Ecole Polytechnique Federale de Lausanne)

RESEARCH GRANTS

FISCAL YEAR 2018 GRANTS

AUSTRALIA
- Understanding the Complex Microstructure of Additively Manufactured Alloys (AMAs) and Its Relationship to Durability (Monash University)
- Trans-Jacket Fibre Bragg Gratings for In-Situ Health Monitoring of Defence Platforms in Harsh Environments (Monash University)
- Neurobiology of Decision Making (Monash University)
- Distributed Symbolic-Non-Symbolic Context-Aware Swarm Logics (University of New South Wales)

BRAZIL
- Ion Beam Assisted Deposition of Gallium Oxide Based Films for High Power Device Applications (Universidade de Sao Paulo)

CANADA
- How the Brain Builds Visual Object Detectors (Royal Institution for the Advancement of Learning / McGill University)

CHILE
- Study of the Non-Equilibrium Magnetic Properties of Individual Molecules for Quantum Information (Pontifica Universidad Catolica de Chile)

FRANCE
- Ion Transport in Growing Oxide Layers on Cr-Containing Alloys (Centre National de la Recherche Scientifique))
- Understanding & Modeling Stress-Difusion Coupling Effects in Carbon Fiber Reinforced Marine Composites (Inst Fr Recherche Pour LExploi Mer)

GERMANY
- Basic Icebreaking Study (Hamburgische Schiffbau-Versuchsanstalt GmbH)
- Experimental Analysis of Coherent Vortical Structures Behind Fixed and Moving Blunt Bodies (Technischen Universitaet Hamburg-Harburg)
- Influence of Spatial and Temporal Variations in Ice Loading on the Design of Ship Structures (Technischen Universitaet Hamburg-Harburg)

GREECE
- Multi-Dimensional Signal Design for Wideband HF Links (Institute of Accelerating Systems and Applications)

INDIA
- Shock Wave Propagaion Physics Through a Medium (Indian Institute of Technology Kharagpur - Nilanjan Mitra)

ISRAEL
- Predictive CFD Modeling and Experimental Studies of Basic Processes in Static and Flowing-Gas K DAPLs (Ben-Gurion University of the Negev)
- Studies Related to Cold Atoms Frequency Standards (Ben-Gurion University of the Negev)
- Study of Advanced Methods for Characterization of Multilayer Semiconductors (Ben-Gurion University of the Negev)

ITALY
- Analytical and Numerical Methods for Identifying Principal Components of Heterogeneous Physical Data (Consiglio Nazionale delle Ricerche Istituto)
- Collective of Decisions in Dynamic Environments (Consiglio Nazionale delle Ricerche Istituto)
- Effects of Superhydrophobic Surfaces on Turbulent Boundary Layer Induced Vibration and Drag (Consiglio Nazionale delle Ricerche Istituto)

RESEARCH GRANTS

FISCAL YEAR 2018 GRANTS (CONT).

JAPAN
- Advanced Terahertz Communication Systems Based on Uni-Traveling-Carrier Photodiode Transmitters and Plasmonic (Osaka University)
- Development of Re(Al,Si)1.8 Coating Systems on Nb-Hf Alloys and Its Oxidation Property at High Temperatures (DBC System R&D Co., Ltd.)

LUXEMBOURG
- HUNTED - Heterogeneous Multi-Swarms of Unmanned Autonomous Systems for Mission Deployment (University du Luxembourg)

REPUBLIC OF KOREA
- Supporting Learning & Collaboration in Online Discussion (KAIST)

SWEDEN
- Power-Scalable Blue Fiber Lasers (Kungliga Tekniska Högskolan)

UNITED KINGDOM
- Compact High-Power Microwave Oscillators (University of Strathclyde)
- Coordinated Swarm Behavior with Minimal Communication in Complex Topographies (University of College London)
- Data Integrated Models of Unsteady Ship Hydrodynamic Forces (University of Southampton)
- Living Materials: Beyond Self Healing (Imperial College London)
- Nano-structured Metamaterials for High-Tc Superconductivity (University of Cambridge)
- Novel Characterization Methods for Next Generation Ferroelectric Transduction (Electrosciences Ltd)
- Optical Magnetic Field Sensor (United Kingdom)
- Provenance Analytics for Command and Control (King's College London)
- Swarm Awareness (The University of Sheffield)

FISCAL YEAR 2019 GRANTS

AUSTRALIA
- Characterisation of Long Lengths of Commercial High Temperature Supoerconducting (HTS)Tape and Wire (Queensland University of Technology)
- Nucleation and Cavitation Inception in Tip Leakage Flows (University of Tasmania)
- Detect, Explore and Neutralize New Threats Using Advanced Machine Learning (University of Technology Sydney)

BANGLADESH
- Non-invasive Measurement of Sea Ice Thickness Using Low Frequency EM Waves (Anyeshan Limited)

BELGIUM
- Mergeable Nervous Systems for Robotic Swarms (Universite Libre De Bruxelles)

BRAZIL
- LOAD Project – Long-Term Analysis Of Suspended Particulate Matter Concentrations Affecting Port Areas In Developing Countries (Federal University of Rio Grande - FURG)
- Low-Dimensional Superconductivity for Sensors of Electromagnetic Fields (Fundaçao de Desenvolvimento da Unicamp Funcamp)

RESEARCH GRANTS

FISCAL YEAR 2019 GRANTS (CONT.)

CZECH REPUBLIC
- Advanced Methods for Blind Extraction of Independent Sources from Multi-Sensor Observations (Technical University of Liberec)

FRANCE
- Cavitation Erosion and Unsteadiness (Ctre Nat De La Recherche Scientifique)

GERMANY
- Genetic Determinants for Formate Metabolism in Methanothermobacter Thermautotrophicus (Eberhard Karls University of Tübingen)

GREECE
- Source Sensitivity Kernels: A New Tool For Noise Cross-correlation Studies (Foundation for Research and Technology Hellas (FORTH)

INDIA
- Bio Inspired Blast Resistant Marine Sandwich Structures (Indian Institute of Science)

ISRAEL
- Anomaly Detection And Machine Learning Using Graph Patterns (Bar-Ilan University)
- Advances in Temporal Data Mining for Clustering, Classification, and Prediction Purposes: Integrating Domain (Ben Gurion University Of The Negev)
- Sensitivity Enhancement of Pulsed Atomic Magnetometer for Minute Changes in Ambient Magnetic Field (Ben Gurion University Of The Negev)

ITALY
- Experimental Study of Propeller-Appendage-Hull Interactions of Underwater Vehicles in Steady Drift (Consiglio Nazionale Delle Ricerche)
- Affordance Landscape Viewer (ALV): Learning New Skills By Visualization Object Affordances That Only Experts Can See (Consiglio Nazionale Delle Ricerche - National Research Council, Rome)

JAPAN
- Multi-Source Learning Coupled with Reasoning Capabilities for Large-Scale Decision Support Environments (Japan Advanced Institute of Science and Technology)
- Improvement of Thermal Stability of PIN-PMN-PT Single Crystal (JFE Mineral Company, Ltd.)

LUXEMBOURG
- Liquid Crystal-Bead Reflectors Illuminating the Needle In the Haystack (LAB'RINTH) - (University of Luxembourg)

MEXICO
- Integrated Thermo-Mechanical Monitoring of Composites Using Carbon Nanotube Yarns (Centro de Investigación Científica de Yucatán, A.C.)
- Noncommutative Adaptive Estimation for Dimension Reduction and Data Clustering (Centro De Investigacion En Matematicas, A.C)

NETHERLANDS
- Turbulence Improvements By Combination Of Dedicated Hardware And Software (Netherlands Organization for Applied Scientific Research TNO)

RESEARCH GRANTS

FISCAL YEAR 2019 GRANTS (CONT.)

NEW ZEALAND
- A Fully Certified Quantum Random Generator – Theoretical Part (ELCRIS)
- Prediction In Evolving Data Streams Using An Adaptive System (The University of Auckland)

NORWAY
- Under-Ice and Canape: Analysis And Publication (Stiftelsen Nansen Senter for Miljø og Fjernmåling)

REPUBLIC OF KOREA
- Millimeter Wave Adaptive Power Beaming of UAVs (Soongsil University Industry-Academic Cooperation Foundation)

SAUDI ARABIA
- Exploring the Fundamental Mechanisms of Light Modulation and Amplification in Halide-perovskite Nanostructures (King Abdullah University of Science and Technology)

SERBIA
- Aggregating Computational Algorithms And Human Decision-Making Preferences In Multi-Agent Settings (Univerzitet U Beogradu-fakultet Organizacionih Nauka)

SINGAPORE
- A Universal Hardware-In-Loop Platform for Hybrid AC/DC Microgrids (Nanyang Technological University)
- Transformer-Less Topologies and Control Techniques for Medium-Voltage Battery Energy Storage Systems (Nanyang Technological University)
- Adaptive GHz Devices (Singapore University of Technology and Design)
- Fractional Modeling of Electromagnetic Wave Propagation in Meta-Materials (Singapore University of Technology and Design)

SLOVENIA
- Optical Fiber Sensors For Direct Corrosion Monitoring And Detection (Univerza v Mariboru)

SPAIN
- Plant Intelligence for Robotics and AI (Universidad de Murcia)

SWITZERLAND
- Electrically and Optically Induced Strain in Single Crystals of Hybrid Perovskites (Methylammonium Lead Halides) - (Ecole Polytechnique Fédérale de Lausanne)
- Zero-Power Sensing for Underwater Monitoring (Eidgenössische Technische Hochschule, ETH Zurich)

TAIWAN
- Cross-slope Acoustic Scattering & Transmission Experiment (CASTEx) in the Northeastern South China Sea (National Sun Yat-sen University)
- Experimental Investigation on High-Reynolds-Number Flows around a 6:1 Prolate Spheroid (National Taiwan Ocean University)
- Correlation Spectra in Nonlinear Modulation Instabilities and Rogue Waves (National Tsing Hua University)

THAILAND
- Development of Wearable Amine/Ammonia Sensors for Health Monitoring (CIMS Holding Company Limited)

RESEARCH GRANTS

FISCAL YEAR 2019 GRANTS (CONT.)

UNITED KINGDOM
- Anticipating Decisions And Bell's Bound (The City University, London)
- DNA-enabled Biobattery – Seeking To Address The Limitations Of Portable Power Supply (Touchlight Genetics Limited)
- Transforming Additive Manufacturing via In-situ and Operando Synchrotron Imaging (University College London (UCL))
- Electromagnetic Scattering from Rough Surfaces in Three Dimensions at Low Grazing Angles (University of Cambridge)
- Estimating Causal Treatment Effects: A Theoretical and Computational Framework for Model Evaluation, Selection and Development (University of Cambridge)
- Proposal for a Deterministic Solid-State Quantum Memory (University of Cambridge)
- Radar Analysis And Prediction Of Intentions/behaviour Of Small Drones' Swarms - Rapid (University of Glasgow)
- Voltage Controlled Quantum Logic with Trapped Ions (University of Sussex)

FISCAL YEAR 2020 GRANTS

ARGENTINA
- Chronobiology of Antarctic Isolation: the use of Belgrano II Antarctic Station as a Space Analogue (Fundacion Argentina del Sueño)
- Metal-Organic Frameworks (MOFs) Incorporating Macrocycles For The Capture And Irreversible Fixation Of Air Toxins (Instituto de Investigaciones en Fisicoquimica de Cordoba)

AUSTRALIA
- Explosive Blast Response of Naval Composites in Arctic Conditions (Royal Melbourne Institute Of Technology)
- Global-X - Diamond-Doped Fiber Optic Networks For Persistent Magnetic Field Sensing (Royal Melbourne Institute of Technology)
- Robust Flight Control Systems For Miniature Lighter-Than-Air Robots (The University of New South Wales)
- The Role Of Extreme Unsteady Velocity Fluctuations In Helicopter Landing On Ships (University of Melbourne)
- Using Machine-Learning To Develop A Novel Selective Scale-Resolving Framework For Accurate Flow And Noise Predictions Of Naval Applications (University of Melbourne)
- Wave-Ice-Ocean Interactions: Measurements, Modelling and Generated Acoustic Noise (University of Melbourne)
- Simulating Chemical Dynamics on Trapped-Ion Quantum Computers (University of Sydney)
- Global-X Event-Based Sensing in the Underwater Environment (Western Sydney University)

BRAZIL
- Relation of Driving Pressure in the Acute Respiratory Distress Syndrome (ARDS) and Local Lung Tissue Damage under COVID-19 Pandemic through Cyber Physical Emergency Lung Ventilators (Assoc. do Lab. de Sistemas Integráveis Tecnológivo LSITEC)
- Study of a Sulfate Reducing Bacteria Gene Expression to Better Understanding the Mechanism of H2S Production and dsrAB Gene Expression (Fundacao de Ciencia, Aplicacoes e Tecnologia Espaciais)
- Triggered Anti-Fungal Hydrogels for the Treatment of Candida Infections (Fundação Joseense de Ensino e Pesquisa em Odontologia)

RESEARCH GRANTS

FISCAL YEAR 2020 GRANTS (CONT.)

BRUNEI
- Biosonar Characterization of Microhabitats for Rhinolophid & Hipposiderid Bats in Brunei (Faculty of Science, Universiti Brunei Darussala)

CHILE
- Early Warning Signals in Social Critical Episodes (Juan Pablo Cardenas Servicios Informaticos Investigaciones)

COSTA RICA
- Production and Characterization of Microcontact Printed Substrates with Potential for Bacteria Repellency and Generation of Mechano-Bactericidal Nanostructured Surfaces (Fundacion Centro de Alta Tecnologia)

CZECH REPUBLIC
- Anticipative Point-Mass Method for High-Performance Estimation and Navigation (APHEN) - (Zapadoceska Univerzita v Plzni)

FRANCE
- Efficient Temporal Learning and Inference for Multiple Source (Fondation Voir et Entendre, Institut de la Vision)

GERMANY
- Correlational Investigation And Directed Design Of Spider Major Ampullate Silk Structure-function Relationship (University of Bayreuth)

GREECE
- Peak-Time Sensitivity Kernels for Noise Cross-Correlation Patterns (PTSK) - (Evangelia Hatzidaki)

ITALY
- Volumetric Correction Of The Aberrations With Multi Actuator Adaptive (Institute of Photonics and Nanotechnology)
- SMXB-Fatigue: Numerical Prediction Of Delamination Growth Under Fatigue Loading Conditions (Engineering Universita' Degli Studi Della Campania Luigi Vanvitelli)
- Target Re-Association for Autonomous Agents (TRAAA) - (Universita' Degli Studi Di Udine)

JAPAN
- Homoepitaxial Ga_2O_3 Structures for Power Device Applications (Novel Crystal Technology, Inc.)

MEXICO
- Study and Analysis of the Aerodynamic Coupling of Multiple UAVs in Formation Flight (Universidad Autonoma de Nuevo Leon)
- A New Generation of Chassis to Gene Expression: from Yucatán to Synthetic Biology (Universidad Nacional Autónoma de México)

POLAND
- Test Campaign Florida June 2020 (Politechnika Wroclawska)

REPUBLIC OF KOREA
- Stochastic Modeling Of Ship Dynamics In Irregular Waves By Explainable Artificail Intelligence And Free-running Model Tests (Chungnam National University)
- The Role Of Mixing In Continental Shelf Waters Of The Southwestern Japan/east Sea (Geosystem Research Corp.)
- Rethinking Wireless Interference: Interference-Free Multiple Access for Wideband MIMO Communication Systems (Pusan National University)

RESEARCH GRANTS

FISCAL YEAR 2020 GRANTS (CONT.)

REPUBLIC OF KOREA (CONT.)
- Physics-Based Direct Simulation of Multiple UNDEX Using High-Fidelity Numerics and Accurate Description of Thermodynamics and Phase Change (Seoul National University)

SLOVENIA
- Sonogenetics: Remote Modulation Of Gene Expression By Ultrasound (National Institute of Chemistry)

SWEDEN
- Geodesic Luneburg Lenses For High Power Applications (Kungliga Tekniska Hogskolan)
- Multisensory Cue Integration In A Navigating Dung Beetles (Lund University)
- Nano-Optoelectronics For Insect Brain Inspired Neuromorphic Computing (Lund University)
- "COVID-19" Dynamic Alignment And Characterization Of Plasmonic Aerosols (RISE Research Institutes of Sweden)

SWITZERLAND
- Perovskite Crystals: A) In-situ Microscopic And Nonlinar Studies In PMN-PT B) Multiple Properties Coupling In Organometallic Halides (Ecole Polytechnique Fédérale de Lausanne)
- AI-Based Workload Monitoring to Enhance Human-Machine Symbiotic Collaboration (Ecole Polytechnique Fédérale de Lausanne)

UNITED KINGDOM
- AI for Scientific Discovery: Developing Artificial Intelligence Systems Capable of Nobel-Quality Discoveries by 2050 (Alan Turing Institute)
- HALOPT 2.0: Affordable, Sustainable, Secure and Distributed Biomanufacture in Halomonas with Optogenetic Control (C3 Bio-Technologies Limited)
- Development of Materials and Processes for Tandem Perovskite / Silicon Solar Cells (Chancellor Masters and Scholars of the University of Oxford)
- Global-X Bacterial Flagellar Motor As A Multimodal Biosensing Chip (The University Court of the University of Edinburgh)
- Non-contact Characterisation of Miniature Piezocrystal Samples (The University of Glasgow)
- Artificial Intelligence to Simulate Earth's Stratosphere (The University of Oxford)
- Fundamental Experiments And First-principles Theory On High Performance Ferroelectric Hafnia For Electronic Applications (University College London)

UNITED KINGDOM (CONT.)
- Emergent Metamaterials For Cactus Spider Silk Hydrogels For Next Generation Multifunctional And Sustainable Energy Absorption Solids (University of Bristol)
- Geometry Of Information Flow And Uncertainty Quantification For Robust Neural Network Architectures In Deep Learning (University of Edinburgh, Department of Mathematics)
- Global-X Engineered Biofilms with Modular Functionality for Persistent and Survivable Naval Platforms (University of Essex)
- Multiple Level Modeling and Assessment of Ship Maneuvering in Extreme Waves (University Of Strathclyde Viz Royal)

VIETNAM
- Improving The Characterization And Understanding Of Global Contribution To Environmental Impacts Of Plastic Debris In Aquatic Environments (Institute for Environment and Resources)

Research Grant

OUTCOMES & RESULTS

(Sample)

Covert State Discovery and Multi-Agent Reinforcement Learning for Human-Autonomy Teaming

- *Presentation*: "Hierarchical and Non-Hierarchical Multi-Agent Interactions Based on Unity Reinforcement Learning", Adaptive Agents and Multi-Agents Systems (AAMAS), (2020), Zehong Cao, KaichiuWong, Quan Bai, Chin-Teng Lin: https://www.researchgate.net/profile/Zehong_Cao2/publication/341649661_Hierarchical_and_Non-Hierarchical_Multi-Agent_Interactions_Based_on_Unity_Reinforcement_Learning/links/5ecd10b34585152945105210/Hierarchical-and-Non-Hierarchical-Multi-Agent-Interactions-Based-on-Unity-Reinforcement-Learning.pdf

- *Presentation*: Carlos A. Tirado Cortes, Hsiang-Ting Chen, and Chin-Teng Lin. 2019. Analysis of VR Sickness and Gait Parameters During Non-Isometric Virtual Walking with Large Translational Gain. In 25th ACM Symposium on Virtual Reality Software and Technology (VRST '19), November 12–15, 2019, Parramatta, NSW, Australia. ACM, New York, NY, USA 2 Pages: https://doi.org/10.1145/3359996.3364741

- *Presentation*: "Prediction Error Negativity in Physical Human-Robot Collaboration", 2020 8th International Winter Conference on Brain-Computer Interface (BCI), Avinash Kumar Singh ; Stefano Aldini ; Daniel Leong ; Yu-Kai Wang ; Marc G. Carmichael ; Dikai Liu ; Chin-Teng Lin: https://doi.org/10.1109/BCI48061.2020.9061616

- *Publication:* Lin, C.-T.; Liu, C.-H.; Wang, P.-S.; King, J.-T.; Liao, L.-D. Design and Verification of a Dry Sensor-Based Multi-Channel Digital Active Circuit for Human Brain Electroencephalography Signal Acquisition Systems. Micromachines 2019, 10, 720: https://www.mdpi.com/2072-666X/10/11/720

- *Publication:* "Analysis of VR Sickness and Gait Parameters During Non-Isometric Virtual Walking with Large Translational Gain", Carlos A. Tirado Cortes, Hsiangting Chen, Chin-Teng Lin, VRCAI '19: The 17th International Conference on Virtual-Reality Continuum and its Applications in IndustryNovember 2019 Article No.: 16 Pages 1–10: https://dl.acm.org/doi/abs/10.1145/3359997.3365694

- *Publication*: A. K. Singh, H. Chen, K. Gramann and C. Lin, "Intraindividual Completion Time Modulates the Prediction Error Negativity in a Virtual 3-D Object Selection Task," in IEEE Transactions on Cognitive and Developmental Systems, vol. 12, no. 2, pp. 354-360, June 2020, doi: 10.1109/TCDS.2020.2991301: https://ieeexplore.ieee.org/abstract/document/9082027

Exploring the Fundamental Mechanisms of Light Modulation and Amplification in Halide-perovskite Nanostructures

- *Patent (pending) : Patent application number: US62/809,987, PCT/IB2020/051394* - Title: Perovskite-doped fiber-amplifier for optical fiber communication using visible light, Application date: 19 February 2020

Research Grant

OUTCOMES & RESULTS
(Sample)

Context-Aware Intent Prediction

- *Publication*: "Quaternion Knowledge Graph Embeddings", Shuai Zhang†, Yi Tayψ, Lina Yao, Qi Liu, Neural Information Processing Systems (NIPS) 2019: http://papers.nips.cc/paper/8541-quaternion-knowledge-graph-embeddings.pdf

- *Presentation*: Xiang Zhang, Lina Yao, and Feng Yuan. 2019. Adversarial Variational Embedding for Robust Semi-supervised Learning. In Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD '19). Association for Computing Machinery, New York, NY, USA, 139–147. DOI:https://doi.org/10.1145/3292500.3330966

- *Presentation*: X. Zhang, L. Yao, X. Wang, W. Zhang, S. Zhang and Y. Liu, "Know Your Mind: Adaptive Cognitive Activity Recognition with Reinforced CNN," 2019 IEEE International Conference on Data Mining (ICDM), Beijing, China, 2019, pp. 896-905, doi: 10.1109/ICDM.2019.00100: https://ieeexplore.ieee.org/abstract/document/8970840

- *Press Release:* UNSW Press Release: https://newsroom.unsw.edu.au/news/science-tech/how-humans-are-teaching-ai-become-better-second-guessing

- *Press Release:* ONR Global Press Release: https://www.defenceconnect.com.au/key-enablers/6505-onr-unsw-explore-human-machine-interface

Molecular Mechanisms of Barnacle Adhesion: A Combined Structural Biology and Computational Study

- *Publication:* Murugan, V.K., Mohanram, H., Budanovic, M. et al. Accelerated corrosion of marine-grade steel by a redox-active, cysteine-rich barnacle cement protein. npj Mater Degrad 4, 20 (2020). https://doi.org/10.1038/s41529-020-0124-z

- *Publication:* Kumar, A., Mohanram H., Jianguo et al. Disorder-Order Interplay of a Barnacle Cement Protein Triggered by Interactions with Calcium and Carbonate Ions: A Molecular Dynamics Study. (pending in "Chemistry of Materials").

- *Presentation*: Dr. Akshita Kumar presented an oral talk titled "Revealing hardy crustaceans sticky affair with surfaces" at the 5th Annual Proteins and Peptides Symposium Singapore (held in Singapore, 12-13 Dec, 2019).

Airplane-borne high performance coherent Doppler Lidar (CDL) to detect wake turbulence

- *Press release: https://www.jiji.com/jc/article?k=000000004.000059540&g=prt*

Research Grant
OUTCOMES & RESULTS
(Sample)

Distributed Symbolic-Non-Symbolic Context-Aware Swarm Logics

- *Publication:* N. K. Long, K. Sammut, D. Sgarioto, M. Garratt and H. A. Abbass, "A Comprehensive Review of Shepherding as a Bio-Inspired Swarm-Robotics Guidance Approach," in IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 4, no. 4, pp. 523-537, Aug. 2020, doi: 10.1109/TETCI.2020.2992778: https://ieeexplore.ieee.org/abstract/document/9099485

- *Publication:* Martin Rosalie, Emmanuel Kieffer, Matthias R. Brust, Grégoire Danoy, Pascal Bouvry,Bayesian optimisation to select Rössler system parameters used in Chaotic Ant Colony Optimisation for Coverage, Journal of Computational Science, Volume 41, 2020, 101047, ISSN 1877-7503: https://doi.org/10.1016/j.jocs.2019.101047

Vision Enhancement using Eye Tracked Augmented Reality

- *Publication*: Effects of Throughput Delay on Perception of Robot Teleoperation and Head Control Precision in Remote Monitoring Tasks", PRESENCE: Virtual and Augmented Reality, Vol. 27, p. 226, (2020), Jason Orlosky, Konstantinos Theofilis, Kiyoshi Kiyokawa, Yukie Nagai: https://www.mitpressjournals.org/doi/abs/10.1162/pres_a_00328

- *Publication*: "OrthoGaze: Gaze-based three-dimensional object manipulation using orthogonal planes", Computers Graphics, Vol. 89, p. 1, (2020), Chang Liu, Alexander Plopski, Jason Orlosky: https://www.sciencedirect.com/science/article/abs/pii/S0097849320300431?via%3Dihub

- *Publication:* Using Eye Tracked Virtual Reality to Classify Understanding of Vocabulary in Recall Tasks", 2019 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR), San Diego, CA, USA, Jason Orlosky, Brandon Huynh, Tobias Hollerer: https://ieeexplore.ieee.org/document/8942340/

- *Publication*: Eye Gaze-based Object Rotation for Head-mounted Displays, ACM SUI 2020.

- *TRL Progression:* Developed a novel interface for teleoperation of drones for navigation in complex environments that provides a user with environment-adaptive viewpoints that is automatically configured to improve safety and provide smooth operation.

- *TRL Progression:* Developed prototype augmented reality interface for language and concept learning that automatically recognizes user understanding of terms based on analysis of eye movements within a learning environment

- *Knowledge Transfer:* Presented at the Program Review for Human Performance Training and Education (ONR Code 34)

Research Grant

OUTCOMES & RESULTS

(Sample)

Tactile Sensing and Feedback for Grip Security

- *TRL Progression:* The co-investigators prototyped tactile sensing technology and a force-controlled gripper to provide reliable robotic gripping for objects that could otherwise be easily damaged. Their sensors and effectors are work towards giving robots a human-like sense of touch and dexterous gripping. Their tactile sensor is made of an array of soft pillars which can be deflected independently. The displacement of each pillar is measured using an optical technique the investigators developed and patented under this current grant.

- *Patent:* Patent application 'Friction-based tactile sensor for measuring grip security' reached national/regional phase on 14 Feb 2020. Filings have been made in Australia, USA, Europe, China, India, Japan and South Korea.

- *TRL Progression:* Established start-up company to market technology developed under ONRG grant:
 http://www.contactile.com

- *TRL Progression:* Built a development kit sensor with 3x3 sensing elements on an 8.5 mm grid (https://youtu.be/cD3xZ625wpo). Four development kits sold to Rice University, USA; SIGMA Clermont, France; Ecole Centrale de Lyon, France; and Queensland University of Technology, Australia.

- *TRL Progression:* Awarded NSW MVP grant to develop a commercially manufacturable sensor (completed 31 March 2020). Executed a license agreement with New South Innovation (UNSW technology transfer) on 28th Feb 2020.

- *Awards-Recognition:* Top 5 from 1200+ applications in the Idea for new business category in the St George Kick Start competition: www.stgeorge.com.au/business/kickstart

- *Awards-Recognition:* Demonstrated the real-time slip detection and friction estimation for dynamic grip force control at the IEEE World Haptics Conference – named as one of four finalists (from 65 demonstrations): https://youtu.be/i7AUcamLs8I / https://youtu.be/BqWBpxxP4bI

Gas Narcosis in Hyperbaric Environments

- *Publication*: Pupillometry is not sensitive to gas narcosis in divers breathing hyperbaric air or normobaric nitrous oxide, Diving and Hyperbaric Medicine Volume 50 No. 2 June 2020 - Xavier CE Vrijdag Hanna van Waart, Jamie W Sleigh, Simon J Mitchell: DOI: https://doi.org/10.28920/dhm50.2.115-120

- *Presentation*: "Investigating critical flicker fusion frequency for monitoring gas narcosis in divers" The Undersea and Hyperbaric Medical Society (UHMS), Xavier Vrijdag (Corresponding Author), Hanna van Waart (Co-author), Jamie Sleigh (Co-author), Costantino Balestra (Co-author), Simon Mitchell (Co-author)

- *Knowledge Transfer:* Presented at the ONR Code 34 Undersea Medicine Program Review

Optimizing Cognitive Performance by Mimicking Slow-Wave Sleep in the Awake Brain

- *Publication*: Current challenges: the ups and downs of tACS", Experimental Brain Research, (Oct, 2019), Nicholas Bland, Martin Sale - https://link.springer.com/article/10.1007/s00221-019-05666-0
- *Publication*: Slow oscillating transcranial alternating current stimulation applied during a motor training task enhances the e effectiveness of training.", Neural Plasticity, Martin Sale, Anastasia Kuzovina

The Impact of Sleep Restriction and Circadian Misalignment on Decision Making

- *Knowledge Transfer:* Prof. Drummond recently met with Michael Decker of the Naval Aerospace Medical Research Laboratory in Dayton, Ohio. He and Dr. Decker discussed a potential collaboration where they would insert one of the decision tasks from this grant into a new study Dr. Decker is starting. Prof. Drummond has offered to provide him all of the information, and training his team needs to implement the task into his project.
- *Knowledge Transfer:* Participated in meetings with ONR and Naval Health Research Center to develop ideas about how to support ONR Code 34's HPT&E Program and DoD's interest in sleep research as it relates to warfighter performance.

Development of Fatigue Monitoring Indicator based on Affordable and Portable Biofeedback Technology for Concurrent High-Intensity Physical and Cognitive Tasks

- *Publication:* Comparison of workload perception for original and modified cognitive tasks. Industrial Engineering and Management Systems: https://www.researchgate.net/publication/338450621_Comparison_of_Workload_Perception_for_Original_and _Modified_Cognitive_Tasks

Bio-Inspiration From a 400 million-year-old Arms-Race: Stomatopods

- *Publication:* HH Thoen, GH Wolff, J Marshall, ME Sayre, NJ Strausfeld 2019. The reniform body in Stomatopoda. J. Comp Neurol: DOI: 10.1002/cne.24788.
- *Publication*: WS Chung, ND Kurniawan, NJ Marshall 2020. Towards an MRI based mesoscale connectome of the squid brain. iScience: 100816. doi.org/10.1016/j.isci.2019.100816.
- *Publication*: NJ Marshall, SB Powell, TW Cronin, et al 2019 Polarization signals: a new currency for communication J. Exp. Biology 222: jeb134213: doi: 10.1242/jeb.134213.
- *Publication*: SB Powell, R Garnett, J Marshall, C Rizk, V Gruev 2018. Bioinspired polarization vision enables underwater geolocation. Science Advances 4 (4), eaao684: DOI: 10.1126/sciadv.aao6841.

Research Grant

OUTCOMES & RESULTS

(Sample)

Development of Wearable Amine/Ammonia Sensors for Health Monitoring

- *Publication:* T. Eamsa-Ard, T. Seesaard, T. Kerdcharoen, "Human Odor Sensing for Health Status Detection and Tracking by Using Electronic Nose", 2019 IEEE International Conference on Consumer Electronics - Taiwan, ICCE-TW 2019, Article number 8991859: DOI: 10.1109/ICCE-TW46550.2019.8991859. (Indexed in SCOPUS, IEEE Explore Database)
- *Publication*: Thara Seesaard, Ilda Kazani, Carla Hertleer, Tanthip Eamsa-ard, Chayanin Khunarak, Lieva Van Langenhove, Teerakiat Kerdcharoen, "The development of fabric-based screen-printed gas sensors for intelligent smelling shirt system", manuscript to be submitted for publication.
- *Award-Recognition:* The recipient of National Invention Award from the National Research Council of Thailand, received on 2nd February 2020.

Nucleation and Cavitation Inception in Tip Leakage Flows

- *Publication*: Russell, P., Venning, J., Pearce, B. W., and Brandner, P. A. (2020). Calibration of Mie scattering imaging for microbubble measurement in hydrodynamic test facilities. Experiments in Fluids, 61(4), 1-17
- *Publication*: Russell, P. S., Barbaca, L., Venning, J. A., Pearce, B. W., and Brandner, P.A. (2020). Measurement of nuclei seeding in hydrodynamic test facilities. Experiments in Fluids, 61(3), 1-18

Using Machine-Learning to Develop a Novel Selective Scale-Resolving Framework for Accurate Flow and Noise Predictions of Naval Applications

- *Publication*: Weatheritt, J., Sandberg, R.D., 2019 "Improved Junction Body Flow Modeling Through Data-Driven Symbolic Regression", Journal of Ship Research, https://doi.org/10.5957/JOSR.09180053Wilsby
- *Presentation*: O., Illingworth, S., Sandberg, R.D., 2019, "Data-Driven RANS Closures for Trailing Edge Noise Predictions," 25th AIAA/CEAS Aeroacoustics Conference (Aeroacoustics 2019), May 20-24, 2019, Delft, The Netherlands.

Optimization of Carbon Fiber Surfaces for Advanced Composites

- *Knowledge Transfer:* Novel electrochemical surface grafting techniques for mechano-chemi-electrical property modification of Carbon fibers with the potential to upgrade lower cost fibers into higher performance, "heal" surface and micro-structural defects, and create bespoke fiber/resin interface control.
- *Publication*: https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Afcbf8465-85d4-4ca8-b2f2-e91783ef4370#pageNum=10

Structural Integrity of Composite and Adhesively Bonded Aircraft Structures from the Perspective of Multiaxial Cyclic Loading

- *Knowledge Transfer:* Applying advanced modeling development to predict mechanical response of structural polymer composites under dynamic loading in structures with the potential for direct transition via NIAR collaboration into support of the Triton platform if/when successful. This effort is also being coordinated under the USN-DST working group meetings. This collaboration has resulted in nine co-authored publications [2-5, 10-14], with three joint publications in leading International Journals and six International Conference papers. The PI has also been selected as a lead participant in the international round robin test program on delamination growth under cyclic fatigue that ISO has initiated.

Improvement of Thermal Stability of PIN-PMN-PT Single Crystal

- *Knowledge Transfer:* JFE Mineral Advanced Materials (a small business spin-off from JFE) has successfully demonstrated the longest single crystal growth of a compositionally uniform PIN-PMT-PT piezoelectric material. Current research continues on acceptor doping, which if successful, will offer improved sonar transducer capabilities to US (and allied) Navy. While the exact growth methodology is not new, the successful large scale growth of the single crystal material is a break-through in manufacturing science.

Nano-Optoelectronics for Insect Brain Inspired Neuromorphic Computing

- *Presentation:* Results presented to researchers at the leading telecommunications company Ericsson.
- *Presentation*: Results presented at 20th International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD 2020).
- *Knowledge Transfer:* Results provided at ONR Global Swarm Intelligence and Autonomy Portfolio Review

Versatile Adaptive Micro Turbofan Engine Development for UAS Applications

- *Publication (pending):* Submission in International Journal of Turbo and Jet Engine: Palman, M., Leizeronok, B., Cukurel.B, "COMPARATIVE STUDY OF DIFFERENT NUMERICAL APPROACHES TO ADAPTIVE GAS TURBINE CYCLE ANALYSIS"
- *Publication (pending):* Submission to AIAA Journal of Propulsion and Power: Palman, M., Linsky, D., Meizner, R., Leizeronok, B., Gurbuz, T., Hakyemez, D., Acarer, S., Andreoli, V., Vyas, U., Braun, J., Paniagua, G., "Mechanical Design Considerations in Micro-Turbojet to Adaptive Cycle Micro-Turbofan Conversion"

Research Grant

OUTCOMES & RESULTS

(Sample)

Advances in Temporal Data Mining for Clustering, Classification, and Prediction Purposes: Integrating Domain

- *Publication (pending):* Improving multivariate time-series classification in modern cyber-space challenges via novel profiling of temporal behavior. Submitted to the IEEE Transactions on Information Forensics and Security Journal.
- *Publication (pending);* Cluster your mind: temporal clusters of multivariate time-series EEG data for cognitive abilities and states classification. Submitted to The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21), to be held virtually February 2021.

Estimating Causal Treatment Effects: A Theoretical and Computational Framework for Model Evaluation, Selection and Development

- *Presentation:* M van der Schaar gave a Keynote at ICLR 2020, a Tutorial at ICML 2020, 2 Keynotes in Workshops at ICML 2020 (Missing data and AutoML), a Keynote at ICME 2020 all events: https://www.vanderschaar-lab.com/events/
- *Award-Recognition:* Top-10 ICML-author and single woman ML author and single European academic in top-10: https://medium.com/criteo-labs/icml-2020-comprehensive-analysis-of-authors-organizations-and-countries-c4d1bb847fde
- *Publication:* D. Jarrett, M. van der Schaar, "Inverse Active Sensing: Modeling and Understanding Timely Decision-Making," International Conference on Machine Learning (ICML), 2020.
- *Publication*: A. Alaa, M. van der Schaar, "Frequentist Uncertainty in Recurrent Neural Networks via Blockwise Influence Functions," International Conference on Machine Learning (ICML), 2020
- *Publication*: A. Alaa, M. van der Schaar, "Discriminative Jackknife: Quantifying Uncertainty in Deep Learning via Higher-Order Influence Functions," International Conference on Machine Learning (ICML), 2020.
- *Publication*: A. Chan, A. Alaa, Z. Qian, M. van der Schaar, "Unlabelled Data Improves Bayesian Uncertainty Calibration under Covariate Shift," International Conference on Machine Learning (ICML), 2020
- *Publication*: C. Lee, M. van der Schaar, "Temporal Phenotyping using Deep Predicting Clustering of Disease Progression," International Conference on Machine Learning (ICML), 2020
- *Publication*: C. Shen, S. Villar, Z. Wang, M. van der Schaar, "Learning for Dose Allocation in Adaptive Clinical Trials with Safety Constraints," International Conference on Machine Learning (ICML), 2020
- *Publication*: I. Bica, A. Alaa, M. van der Schaar, "Time Series Deconfounder: Estimating Treatment Effects over Time in the Presence of Hidden Confounders," International Conference on Machine Learning (ICML), 2020

Neurobiology of Decision Making

- *Publication:* Distractors selectively modulate electrophysiological markers of perceptual decisions", Cortex, Shou Han Zhou, Gerard Loughnane, Redmond O'Connell, Mark A. Bellgrove, Trevor Chong
- *Presentation:* Early findings presented at the Australian Cognitive Neuroscience society

Estimating Causal Treatment Effects: A Theoretical and Computational Framework for Model Evaluation, Selection and Development (cont.)

- *Publication*: H.-S. Lee, C. Shen, J. Jordon, M. van der Schaar, "Contextual Constrained Learning for Dose-Finding Clinical Trials," International Conference on Artificial Intelligence and Statistics (AISTATS), 2020.
- *Publication:* Z. Qian, A. M. Alaa, A. Bellot, J. Rashbass, M. der Schaar, "Learning Dynamic and Personalized Comorbidity Networks from Event Data using Deep Diffusion Processes," International Conference on Artificial Intelligence and Statistics (AISTATS), 2020
- *Publication*: Y. Zhang, A. Bellot, M. van der Schaar, "Learning Overlapping Representations for the Estimation of Individualized Treatment Effects," International Conference on Artificial Intelligence and Statistics (AISTATS), 2020
- *Publication*: Y. Zhang, D. Jarrett, M. van der Schaar, "Stepwise Model Selection for Sequence Prediction via Deep Kernel Learning," International Conference on Artificial Intelligence and Statistics (AISTATS), 2020.

Non-Invasive Measurement of Sea Ice Thickness Using Low Frequency EM Waves.

- *Publication (pending);* "Low Frequency Near Field Interferometry for Characterization of Lossy Dielectric and an Investigation on Sea Ice" is undergoing review by IEEE Transactions on Geoscience and Remote Sensing (TGRS)

Predictive CFD Modeling and Experimental Studies of Basic Processes in Static and Flowing-Gas

- *Publication:* K. Waichman, B.D. Barmashenko, and S. Rosenwaks, "Dependence of static K DPAL performance on addition of methane to He buffer gas: 3D CFD modeling and comparison with experimental results," J. Opt. Soc. Am. B 36, 3464 (2019). https://doi.org/10.1364/JOSAB.36.003464
- *Publication*: K. Waichman, B.D. Barmashenko, and S. Rosenwaks, "Velocity dependence of the performance of flowing-gas K DPAL with He and He/CH4 buffer gases: 3D CFD modeling and comparison with experimental results," J. Opt. Soc. Am. B 37, 2209 (2020). https://doi.org/10.1364/JOSAB.390706
- *Publication*: I. Auslender, E. Yacoby, B.D. Barmashenko and S. Rosenwaks, "Controlling the beam quality in DPALs by changing the resonator parameters," Appl. Phys. B 126, 91 (2020). https://doi.org/10.1007/s00340-020-07444-1

Research Grant
OUTCOMES & RESULTS
(Sample)

BRAIN-Inspired Networks of Ultrafast LASER Neurons

- *Publication:* BRAIN-inspired networks of ultrafast LASER neuronsPublicationM. Hejda et al, "Spike-based information encoding in vertical cavity surface emitting lasers for neuromorphic photonic systems", in IOP JPhys Photonics, 2, 044001, 2020
- *Publication:* J. Robertson et al, "Ultrafast optical integration and pattern classification for neuromorphic photonics based on spiking VCSEL neurons", in Nature Scientific Reports 10, 6098 (2020)
- *Publication:* J. Robertson et al, "Convolutional Image Edge Detection Using Ultrafast Photonic Spiking VCSEL Neurons" submitted for publication, preprint available in arXiv:2007.10309.
- *Presentation*: A. Hurtado, "Photonic Spiking Neurons with VCSELs for Ultrafast Neuromorphic Photonic Processing Systems", in Photonics North 2020, Niagara Falls, Canada (May 2020)

AI-Based Workload Monitoring to Enhance Human-Machine Symbiotic Collaboration

- *Knowledge Transfer/TRL Progression:* EPFL sensor architecture research demonstration centered on applying the wBMU unit architecture on a US Navy field problem application at Naval Information Warfare Center (NIWC) Pacific
- *Knowledge Transfer/TRL Progression:* Joint collaboration with the Naval Information Warfare Center (NIWC) Pacific project. ONR is funding NIWC Research Scientist on a project titled "AI-Based Cognitive States Monitoring to Enhance Human-Machine Adaptive Collaboration" centered on collaborating with Prof. Atienza's EPFL ESL group. The aim here is early-applied research (6.2) technology transfer of the ONRG supported EPFL research to NIWC Pac.

The Nobel Turing Challenge: Developing an Artificial Intelligence System Capable of Winning a Nobel Prize

- *Publication:* Discovery Magazine article: https://www.discovermagazine.com/technology/the-robot-scientists-are-coming-but-thats-not-a-bad-thing

Design and Synthesis of Metal-Organic Frameworks for Chemical Warfare Agents

- *Publication:* Nanostructured Multifunctional Materials. Chapter 5: Metal-Organic Frameworks (MOFs): Multifunctionality within Order. CRC Press. Editor: Esteban Franceschini; 2) Fostering a Chemistry Safety Culture Despite Limited Resources: A Successful Example from Academic Research Laboratories in Argentina. A.M. Fracaroli, D.A. Caminos, J. Chem. Educ., 2020, https://dx.doi.org/10.1021/acs.jchemed.9b01042
- *TRL Progression:* Follow on early applied research grant.

Research Grant
OUTCOMES & RESULTS
(Sample)

Robust Electronic Excitations in Nanostructures Induced by Topological States of Light

- *Knowledge Transfer/TRL Progression:* Information used in a NRL 6.1 program along with being used in an ONR Code 35 MURI program starting in Spring 2020.
- *Publication* - https://arxiv.org/pdf/2004.10453.pdf; https://arxiv.org/abs/2003.03205; https://arxiv.org/abs/2004.00040

Search for Vulnerabilities of Fundamental Origin in Quantum Key Distribution

- *Publication:* "Simple explanation of the classical limit", A.Hnilo, Found. Phys. 49(12) p.1365-1371 doi.org/10.1007/s10701-019-00310-x (2019).
- *Publication*: "Measuring algorithmic complexity in chaotic lasers", M.Kovalsky, M.Agüero, C.Bonazzola and A.Hnilo, Int.J.Bif. and Chaos, 30 (4) 2050057, (2020), DOI: 10.1142/S0218127420500571.
- *Publication*: "Quantum Mechanical description of Bell's experiment assumes locality"; A.Hnilo, arXiv.org/abs/2002.12153.
- *Publication*: "Non-Boolean Hidden Variables model reproduces Quantum Mechanics' predictions for Bell's experiment", A.Hnilo, arXiv/quant-ph/:2005.10367

On the Permiability of the Malvinas Current

- *Publication:* Beron-Vera, F. J., Bodnariuk, N., Saraceno, M., Olascoaga, M. J., and Simionato, C. (2020). Stability of the Malvinas Current. Chaos: An Interdisciplinary Journal of Nonlinear Science, 30(1), 13152. https://doi.org/10.1063/1.5129441
- *Publication:* Saraceno, M.; Tonini, M.H.; Williams, G.N.; Aubone, N.; Olascoaga, M.J.; Beron-Vera, F.J.; Gonzalez, R.; Soria, M.; Saad, J.F.; Svendsen, G. (2020). On the Complementary Information Provided by Satellite Images, Lagrangian Drifters, and a Regional Numerical Model: a Case Study in the San Matias Gulf, Argentina. Remote Sensing in Earth Systems Sciences. https://doi.org/10.1007/s41976-020-00039-6
- *Publication*: Saraceno Martin, Aubone Nicolas, Saad Juan Francisco, Soria Mariano, Svendsen Guillermo (2019). Lagrangian drifters in the San Matias Gulf, Argentina. SEANOE. https://doi.org/10.17882/74297
- *Knowledge Transfer/TRL Progression:* Working with NOAA on joint program. Increasing in TRL to level 3-4

Analysis of Real Sonar Type Scatter Data Using the Point Cloud Method

- *Publication*: Blaauw, M., J. A. Christen, and M. A. Aquino-L´opez (2020). A review of statistics inpalaeoenvironmental research. Journal of Agricultural, Biological and EnvironmentalStatistics 25 (1), 17–31.

Research Grant
OUTCOMES & RESULTS
(Sample)

Integrated Thermo-Mechanical Monitoring of Composites Using Carbon Nanotube Yarns

- *Publication*: https://doi.org/10.1016/j.mtcomm.2020.101472; DOI: 10.1002/adem.202000220; DOI: 10.1177/1045389X20919979; DOI:10.3390/s20113230

## Solution-Processed Metal Oxide Thin Films for Quantum Dot-Based Photonic Devices

- *Publication*: Photochemical deposition, characterization and optical properties of thin films of ThO2. Y.Huentupil, G. Cabello-Guzmán, B. Chornick, R. Arancibia, G.E. Buono-Core Polyhedron, 157, 225-231 (2019).
- *Publication*: Effect of annealing temperature on the structural, morphological andoptical properties of ThO2 thin films grown by photochemical metal–organicdeposition. R. Arancibia, Y. Huentupil,G.E. Buono-Core, M. Fuentealba, B. Chornik, A. Mendoza-Galván, G.Cabello-Guzmán Polyhedron, 171,374-381 (2019).
- *Publication*: Study of the influence of Er/Lnco-doping in La2O3 thin films on their up-conversionproperties (where Ln = Ho or Nd). G. Cabello-Guzman, C.Caro-Díaz, A. Fernandez-Perez, G.E. Buono-Core, B. Chornik Optical Materials, 99, 109579 (2020).
- *Publication*: Characterization of photochemically grown Pd loaded WO3 thin filmsand its evaluation as ammonia gas sensor. C. Castillo, G. Cabello, B. Chornik, Y. Huentupil, G. E. Buono-Core Journal of Alloys and Compounds, 825, 154166 (2020).
- *Knowledge Transfer/TRL Progression:* Method for deposition of material is currently being transferred to NRL for 6.2 program   Progression to follow on early applied research grant.

Bragg Grating Fiber Laser Ultrasonic Sensors for Structural Health Monitoring

- *Knowledge Transfer:* NRL Code 5674 and ONR Code 332 along with publications being submitted
- *Knowledge Transfer:* Knowledge transfer to NRL code 7500
- *Publication:* Lee, J.-D. and C.-C. Wu*, 2018: The role of polygonal eyewalls in rapid intensification of Typhoon Megi (2010). J. Atmos. Sci., 75, 4175-4199.
- *Publication*: Cheng, C.-J. and C.-C. Wu, 2018: The role of WISHE in secondary eyewall formation. J. Atmos. Sci., 75, 3823-3841.
- *Publication*: Chih, C.-H. and C.-C. Wu, 2020: Exploratory Analysis of Upper Ocean Heat Content and Sea Surface Temperature Underlying Tropical Cyclone Rapid Intensification in the Western North Pacific. J. Climate, 33, 1031-1050.
- *Publication*: Chen, G., C.-C. Wu, Y.-H. Huang, 2018: The role of near-core convective and stratiform heating/cooling in tropical cyclone structure and intensity. J. Atmos. Sci. 75, 297-326.
- *Publication*: Huang, Y.-H., C.-C. Wu*, and M. T. Montgomery, 2018: Concentric eyewall formation in Typhoon Sinlaku (2008). Part III: Horizontal momentum budget analyses. J. Atmos. Sci., 75, 3541-3563

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WHERE GLOBAL CONNECTED THIS YEAR...
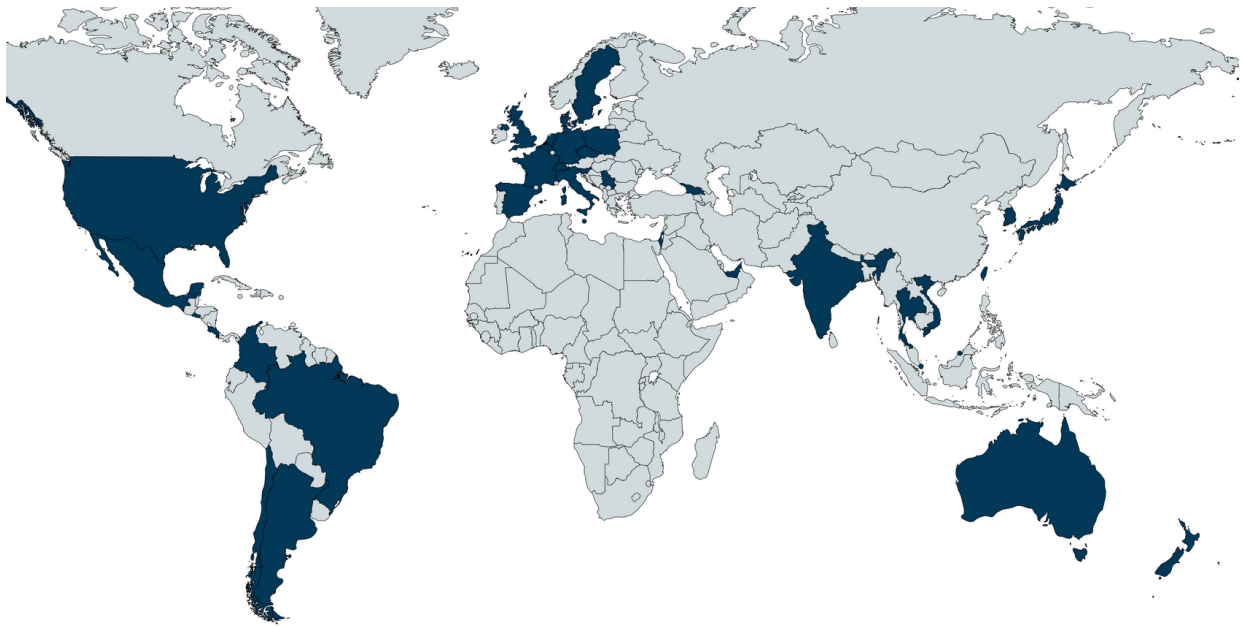
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